STREPTOCOCCUS GROUP A, INVASIVE DISEASE

DISEASE REPORTING

In Washington

New requirements for the reporting of Group A streptococcus (GAS) invasive disease were instituted in December of 2000. In the first year of reporting, DOH received 92 case reports.

Purpose of reporting and surveillance

- To better characterize the epidemiology of this organism.
- To identify sources of transmission (e.g., a health care worker) and to prevent further transmission from such sources.
- To recommend appropriate prevention measures.

Reporting requirements

- Health care providers: notifiable to Local Health Jurisdiction within 3 work days
- Hospitals: notifiable to Local Health Jurisdiction within 3 work days
- Laboratories: no requirements for reporting
- Local health jurisdictions: notifiable to DOH Communicable Disease Epidemiology within 7 days of case investigation completion or summary information required within 21 days

CASE DEFINITION FOR SURVEILLANCE

Clinical criteria for diagnosis

Invasive group A streptococcal infections may manifest as any of several clinical syndromes, including pneumonia, bacteremia in association with cutaneous infection (e.g., cellulitis, erysipelas, or infection of a surgical or nonsurgical wound), deep soft tissue infection (e.g., myositis or necrotizing fasciitis), meningitis, peritonitis, osteomyelitis, septic arthritis, postpartum sepsis (e.g., puerperal fever), neonatal sepsis, and nonfocal bacteremia. Cellulitis in the absence of bacteremia is not considered an invasive GAS infection.

Laboratory criteria for diagnosis

- Isolation of Group A streptococcus (*Streptococcus pyogenes*) by culture from a normally sterile site (e.g., blood or cerebrospinal fluid, or, less commonly, joint, pleural, or pericardial fluid).

Case definition

- Confirmed: a case that is laboratory confirmed.

A. DESCRIPTION

1. Identification

Group A streptococci cause a variety of diseases. The most frequently encountered conditions are streptococcal sore throat and streptococcal skin infections (impetigo or pyoderma). Other diseases include scarlet fever, rheumatic fever, erysipelas, cellulitis, mastoiditis, otitis media, peritonsillitis, wound infections, a toxic shock-like syndrome, and invasive GAS infections. In outbreaks, one form of clinical disease often predominates.

Invasive group A streptococcal (GAS) infections include pneumonia, bacteremia in association with cutaneous infections; deep soft tissue infections (includes necrotizing fasciitis, myositis), meningitis, peritonitis, osteomyelitis, septic arthritis, post-partum sepsis, neonatal sepsis, and nonfocal bacteremia. Necrotizing fasciitis or myositis without isolation of GAS from a sterile site, or cutaneous infections in the absence of bacteremia are not considered invasive GAS disease.

Invasive GAS infections present as multiple clinical syndromes and almost universally require hospitalization. Bacteremia, the most common clinical syndrome, is seen in approximately 75% of patients with invasive GAS disease. The overall case fatality rate of invasive GAS disease is 12.5%, but can be as high as 45% for bacteremic toxic shock syndrome. Older age, toxic shock syndrome, meningitis, and pneumonia are all independent predictors of death.

Erysipelas is an acute cellulitis characterized by fever, constitutional symptoms, leukocytosis and a red, tender, edematous, spreading lesion of the skin, often with a definite raised border. The central point of origin tends to clear as the periphery extends. Face and legs are common sites. Recurrences are frequent. The disease is more common in women and may be especially severe, with bacteremia, in patients suffering from debilitating disease. Case-fatality rates vary greatly depending on the part of the body affected and whether there is an associated disease. Erysipelas due to group A streptococci is to be distinguished from erysipeloid, caused by *Erysipelothrix rhusiopathiae*, a localized cutaneous infection seen primarily as an occupational disease of people

handling freshwater fish or shellfish, infected swine or turkeys or their tissues, or rarely sheep, cattle, chickens or pheasants.

Perianal cellulitis due to group A streptococci has been recognized more frequently in recent years.

Streptococcal puerperal fever is an acute disease, usually febrile, accompanied by local and general symptoms and signs of bacterial invasion of the genital tract and sometimes the bloodstream in the postpartum or postabortion patient. Case-fatality rate is low when streptococcal puerperal fever is adequately treated. Puerperal infections may be caused by organisms other than hemolytic streptococci; while clinically similar, they differ bacteriologically and epidemiologically.

Toxic shock syndrome (TSS) in people with invasive group A streptococcal infection has been increasingly recognized in the USA since 1987. Predominant clinical features include hypotension and any of the following: renal impairment; thrombocytopenia; disseminated intravascular coagulation (DIC); SGOT or bilirubin elevation; adult respiratory distress syndrome; a generalized erythematous macular rash or soft-tissue necrosis (necrotizing fasciitis), the last labeled the “flesh-eating bacteria” by the news media. TSS may occur with either systemic or focal (i.e., throat, skin, lung sites) group A streptococcal infections.

Streptococci of other groups can produce human disease. Beta-hemolytic organisms of group B are frequently found in the human vagina and may cause neonatal sepsis and suppurative meningitis, as well as urinary tract infections, postpartum endometritis and other systemic disease in adults, especially those with diabetes mellitus. Group D organisms (including enterococci), hemolytic or nonhemolytic, are involved in subacute bacterial endocarditis and urinary tract infections. Groups C and G have produced outbreaks of streptococcal tonsillitis, usually foodborne; their role in sporadic cases is less well-defined. Glomerulonephritis has followed group C infections, but has been reported very rarely following group G infection; neither group causes rheumatic fever. Groups C and G infections are more common in adolescents and young adults. Alpha-hemolytic streptococci are also a common cause of subacute bacterial endocarditis.

Provisional laboratory findings that support group A streptococcal disease are based on the isolation of the organisms from the affected tissues on blood agar or other appropriate media. In cultures, streptococci are identified by the morphology of colonies and production of clear β-hemolysis on blood agar made with sheep's blood; tentative identification is shown by inhibition by special antibiotic discs containing 0.02-0.04 units of bacitracin. Definitive identification depends on specific serogrouping procedures. Antigen detection tests are also available for rapid identification. A rise in serum antibody titer (antistreptolysin O, antihyaluronidase, anti-DNA-ase B) may be demonstrated between acute and convalescent stages of illness; high titers may persist for several months.

2. Infectious Agent

Streptococcus pyogenes, group A streptococci of approximately 80 serologically distinct types that may vary greatly by geographic and time distributions. Group A streptococci producing skin infections are usually of different serologic types from those associated with throat infections. In scarlet fever, three immunologically different types of erythrogenic toxin (pyrogenic exotoxins A, B and C) have been demonstrated. In TSS, 80% of isolates produce pyrogenic exotoxin A. While β-hemolysis is characteristic of group A streptococci, strains of groups B, C and G are most often also β -hemolytic. M type mucoid strains are involved in recent outbreaks of rheumatic fever and in invasive necrotizing fasciitis.

3. Worldwide Occurrence

Although reports over the past 10-20 years have suggested an increase in the number of invasive GAS infections, prospective, active, sentinel surveillance began only recently. Active surveillance in selected US sites by CDC shows the incidence of invasive GAS disease to be 3.5 cases per 100,000 (approximately 9600-9700 cases per year). People $\geq$65 years have the highest incidence of invasive GAS disease followed by children $\leq$2 years old. For unknown reasons, invasive GAS disease is seen more frequently among blacks than other races. Similar to streptococcal sore throat and scarlet fever, invasive GAS disease most commonly occurs in the winter and early spring.

Reliable morbidity data do not exist for puerperal fever. In developed countries, morbidity and mortality have declined precipitously since the advent of antibiotics. It is now chiefly a sporadic disease, although epidemics may occur in institutions where aseptic technique is faulty.

4. Reservoir

Humans.

5. Mode of Transmission

Large respiratory droplets or direct contact with patients or carriers, rarely by indirect contact through objects. Nasal carriers are particularly likely to transmit disease. Casual contact rarely leads to infection. In populations where impetigo is prevalent, group A streptococci may be recovered from the normal skin for 1-2 weeks before skin lesions develop; the same strain may appear in the throat (without clinical evidence of throat infection) usually late in the course of the skin infection.

Anal, vaginal, skin and pharyngeal carriers have been responsible for nosocomial outbreaks of serious streptococcal infection, particularly following surgical procedures. Many of these outbreaks have been traced to operating room personnel who were carriers of the streptococcal strain involved. Identification of the carrier often involves intensive epidemiologic and microbiologic investigation; eradication of the carrier state is often difficult and may require multiple courses of various antibiotics. Dried streptococci reaching

the air via contaminated items (floor dust, lint from bedclothing, handkerchiefs) are viable but apparently noninfectious for mucous membranes and intact skin.

Explosive outbreaks of streptococcal sore throat may follow ingestion of contaminated food. Milk and milk products have been associated most frequently with foodborne outbreaks; egg salad and deviled hard-boiled eggs have recently been implicated with increasing frequency. Group A streptococci may be transmitted to cattle from human carriers, then spread through raw milk from these cattle; group B organisms that cause human and bovine disease differ biochemically. Contamination of milk or egg products by humans appears to be the important source of foodborne episodes. Milkborne group C outbreaks have been traced to infected cows.

6. Incubation period

Short, usually 1-3 days, rarely longer.

7. Period of communicability

In untreated, uncomplicated cases, 10-21 days; in untreated conditions with purulent discharges, weeks or months. With adequate penicillin therapy, transmissibility generally is terminated within 24 hours. Patients with untreated streptococcal pharyngitis may carry the organism in the pharynx for weeks or months, usually in decreasing numbers; the contagiousness of these carriers decreases sharply in 2-3 weeks after onset of infection.

8. Susceptibility and resistance

Susceptibility to streptococcal sore throat and scarlet fever is general, although many people develop either antitoxin or type specific antibacterial immunity, or both, through inapparent infection. Antibacterial immunity develops only against the specific M-type of group A streptococcus that induced infection and may last for years. Antibiotic therapy may interfere with the development of type specific immunity. No gender or racial differences in susceptibility have been defined; reports of racial differences probably relate to differing environmental factors.

Repeated attacks of sore throat or other streptococcal disease due to different types of streptococci are relatively frequent. Immunity against erythrogenic toxin, and hence to rash, develops within a week after onset of scarlet fever and is usually permanent; second attacks of scarlet fever are rare, but may occur because of the three immunologic forms of toxin. Passive immunity to group A streptococcal disease occurs in newborns with transplacental maternal type specific antibodies.

Patients who have had one attack of rheumatic fever have a significant risk of recurrence of rheumatic fever with further cardiac damage following group A streptococcal infections. Individuals who have had erysipelas appear to be predisposed to subsequent attacks. Recurrence of glomerulonephritis is unusual.

B. METHODS OF CONTROL

1. Preventive measures:

a. Educate the public and health workers about modes of transmission; about the relationship of streptococcal infection to acute rheumatic fever, Sydenham chorea, rheumatic heart disease and glomerulonephritis; and about the necessity for prompt diagnosis and completion of the full course of antibiotic therapy prescribed for streptococcal infections.
b. Provide easily accessible laboratory facilities for recognition of group A hemolytic streptococci.
c. Pasteurize milk and exclude infected people from handling milk likely to become contaminated.
d. Prepare other foods, such as deviled eggs, just prior to serving or adequately refrigerate in small quantities at 5°C (41°F) or less.
e. Exclude people with skin lesions from food handling.
f. Secondary prevention of complications: To prevent streptococcal reinfection and possible recurrence of rheumatic fever, erysipelas or chorea, monthly injections of long acting benzathine penicillin G (or daily penicillin orally, if the patient is compliant) should be given for at least 5 years. Those who do not tolerate penicillin may be given sulfisoxazole orally.

2. Control of patient, contacts and the immediate environment:

a. Report to local health authority.
b. Isolation: Drainage and secretion precautions; may be terminated after 24 hours' treatment with penicillin or other effective antibiotics; therapy should be continued for 10 days to avoid development of rheumatic heart disease.
c. Concurrent disinfection: Of purulent discharges and all articles soiled therewith. Terminal cleaning.
d. Quarantine: None.
e. Immunization of contacts: None.
f. Investigation of contacts and source of infection: Culture symptomatic contacts. Search for and treat carriers in well-documented epidemics of streptococcal infection and in high risk situations (e.g., evidence of streptococcal infection in families with multiple cases of rheumatic fever or streptococcal TSS, occurrence of cases of rheumatic fever or acute nephritis in a population group such as a school, outbreaks of postoperative wound infections).
g. Specific treatment: Penicillin; several forms are acceptable for treatment: benzathine penicillin G, IM (treatment of choice), or penicillin G (PO) or penicillin V (PO). Penicillin resistant strains of streptococci have not occurred. Therapy should provide adequate penicillin levels for 10 days. Such treatment initiated within the first 24-48 hours may ameliorate the acute illness; however, the bacteria may persist in the pharynx in up to 30% of patients. Therapy will reduce the frequency of suppurative complications and prevent the development of most cases of acute rheumatic fever.

Therapy may also reduce the risk of acute glomerulonephritis and prevent further spread of the organism in the community. Erythromycin is the preferred treatment for penicillin sensitive patients, but strains resistant to this antibiotic have been reported. Clindamycin or a cephalosporin can be used when penicillin and erythromycin are contraindicated. Sulfonamides are not effective in eliminating the streptococcus from the throat or in preventing nonsuppurative complications. Many strains are resistant to the tetracyclines.

3. Epidemic measures

a. Determine the source and manner of spread (i.e., person to person, by milk or food). Outbreaks can often be traced to an individual with an acute or persistent streptococcal infection or carrier state (nose, throat, skin, vagina or perianal area) through identification of the serologic type of the streptococcus.
b. Investigate promptly any unusual grouping of cases to identify possible common sources, such as contaminated milk or foods.
c. For outbreaks in special groups in which individuals have especially close contact, such as military populations and newborn nurseries, it may be necessary to administer penicillin to the entire group to terminate spread.

4. International measures

WHO Collaborating Centres.